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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/673,251

Filing Date: September 30, 2003

Appellant(s): KWAK ET AL.

Kwak et al
For Appellant

EXAMINER'S ANSWER

MAILED

AUG 25 2005

GROUP 2800

This is in response to the appeal brief filed 6/2/2005.

(1) *Real Party in Interest*

A statement identifying the real party in interest is contained in the brief.

(2) *Related Appeals and Interferences*

The brief does not contain a statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief. Therefore, it is presumed that there are none. The Board, however, may exercise its discretion to require an explicit statement as to the existence of any related appeals and interferences.

(3) *Status of Claims*

The statement of the status of the claims contained in the brief is correct.

(4) *Status of Amendments After Final*

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) *Summary of Invention*

The summary of invention contained in the brief is correct.

(6) *Issues*

The appellant's statement of the issues in the brief is correct.

(7) *ClaimsAppealed*

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) *Prior Art of Record*

| | | |
|-----------|--------|---------|
| 6,468,902 | Kawai | 10-2002 |
| 5,905,275 | Nunoue | 5-1999 |

(9) *Grounds of Rejection*

Claims 1-4, 6, 9-27, and 31-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawai(US 6,468,902) in combination with Nunoue et al (US5,905,,275).

Kawai teaches a method of forming light emitting devices by the following process steps: Providing a sapphire substrate, successively forming n-type semiconductor layer "53", first cladding layer ""54", first waveguide layer "55", active layer "56", second waveguide layer "57", second cladding layer "58" contact layer "59" and forming electrode p-type electrode "60" and n-type electrode "61" Kawai further discloses etching the sapphire substrate from the bottom surface of the sapphire substrate to expose n-type GaN semiconductor layer "53" (see figs. 3,5,10,1314). With respect to claims 11,22,35, Kawai, in embodiment, teaches coating metal as a shielding layer "36" on the etched portion of the sapphire substrate and forming additional metal

layer "37". Kawai also teaches polishing by grinding and lapping. With respect to claim 24, it is well known to form ridge structure to form LEDs, for example, admitted prior art teaches forming ridge by forming mask pattern on second semiconductor material sequentially patterning second semiconductor layer and second cladding layer "36,32" to form ridge and removing the mask pattern and forming passivation layer "34" on the second clad layer in contact the with a region of patterned second semiconductor layer (see fig.2 and fig.3 and related description in the admitted prior art) in instant invention.

Kawai substantially discloses the similar process as instant claimed process for making light emitting devices except etching the sapphire substrate by mixture of chlorine (Cl_2) and argon (Ar) .

Nunoue discloses a method of of light emitting diode formed on the sapphire substrate, wherein sapphire substrate is etched by dry etching technique in Cl_2 and Ar mixture(see fig.1, 1 a and 7 A-7G and col.4, lines 47-49). It would have been obvious to one of ordinary skill in the art to etch sapphire substrate by dry etching technique in the mixture of Cl_2 and Ar in the invention of Kawai because Nunoue teach dry etching is also suitable to form trenches or visa in the sapphire and to form ohmic contact on the exposed GaN layer "53". Nunoue teaches prior to forming ohmic electrode "70", forming light transparent layer "65" formed of different wide gap materials such as ZnO, GaN, AlN, AlGaN etc., on exposed portion of GaN layer "66" (see col. 8, lines 52-62). It also would have been obvious to one of ordinary skill in the art to modify Kawai by forming light transparent materials prior to formation of ohmic contact "61" because wide band gap materials such as ZnO or AlN etc. would transmit the light

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(10) Response to Argument

Appellant argues that obviousness rejection raised in the office action should not stand because Kawai patent does not describe "dry etching a region of the high-resistant substrate using a reaction gas comprising at least Cl₂ or BCl₃ to expose the first semiconductor layer. Appellant points out that Kawai teaches it is impossible to make via in sapphire by dry etching (col.2, lines 37-44) and making via hole by dry etching can not be employed. Appellant admits that Kawai describes wet etch process phosphoric acid/ sulfuric acid to form via (col.5, 8-10,15-17). Appellant concludes that claims 1 and 23 are considered allowable over the combination of Kawai and Nunoue because neither of them teaches or suggested claimed features.

Appellant "under mischaracterization of the prior art section" argues that Kawai does not teach etching sapphire in the mixture of Cl₂ and Ar and Kawai can not be modified by the Nunoue teaching of etching sapphire in Cl₂ and Ar because Kawai teaches dry etching is impossible to form vias. However, Kawai teaches etching rate is very low and is impossible to make via hole with out using mask. However, Nunoue teaches etching in the sapphire substrate with dry etch ants of Cl₂ and Ar (see fig.1 and col. 4, lines 47-49). Since Nunoue specifically teaches dry etching, the invention of Kawai can be modified to perform dry etching to form via hole. Besides Appellant must realize that kawai teaches dry etching sapphire is slow with a very low etching rate and in the absence of etching mask it is impossible to form via hole by dry etching so it is not negative teaching (see col.37-45).

Appellant argues that Nunoue teaches forming trench by in the sapphire by Cl₂ and Ar followed by wet etching to remove damaged layer and then form multi layer structure in the trench. Appellant argues that , in view of the negative teaching ,impossibility of dry etching in sapphire as disclosed by Kawai can not be modified by the of Nunoue of dry etching in sapphire to show claimed limitation of dry etching to expose the GaN layer as claimed in claim 1 and 23. However, Kawai can be modified by the teaching of dry etching sapphire, as taught by Nunoue, to expose the GaN "2" in the sapphire substrate in the invention of Kawai, because Nunoue teaches etching and forming trench by Cl₂ and Ar. Appellant mention non-related detailed disclosure of Nunoue, which is not relied to reject the claims and only disclosure relied by the examiner in the Nunoue is to show etching sapphire to form trench by Cl₂ and Ar (col4, lines 47-49) Conclusively Kawai in view of Nunoue is not hypothetical combination since Kawai teaches wet etching to form via hole and Nunoue teaches alternative dry etching technique in Cl₂ and Ar to form trench and it is irrespective whether the trench is formed from top or bottom surface of the sapphire substrate as long as trench is formed sapphire by using dry enchants Cl₂ and Ar.

With respect to independent claim 12, Appellant argues that bottom conductive electrode 36/37, where layer "36" is light shielding layer in fig.11, in Kawai covering the exposed portion of GaN layer "22" consists of chromium and gold, and "metal layer 62" is formed of Ti and Al formed on 52/53 buffer/contact GaN layers fro LED structure in fig. 14 and argues that Cr,Au,Ti,Al are not light transmitting layers, which is agreed with the appellant. However, Nunoue teaches prior to forming ohmic electrode "70", forming

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light transparent layer "65" formed of different wide gap materials such as Zno, GaN,

AlN, AlGaN etc., on exposed portion of GaN layer "66" (see col. 8, lines 52-62).

However, Kawai in view of Nunoue would have light transmitting layer prior to forming ohmic electrode "70" because wide band gap materials such as ZnO or AlN etc. would transmit the light. Conclusively, the modified teaching of Kawai as modified by the teaching of Nunoue would reject the claim 12 and dependent claims.

The following ground(s) of rejection are applicable to the appealed claims:

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Savitri Mulpuri
Primary Examiner
Art Unit 2812

sm
August 22, 2005

Conferees


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